

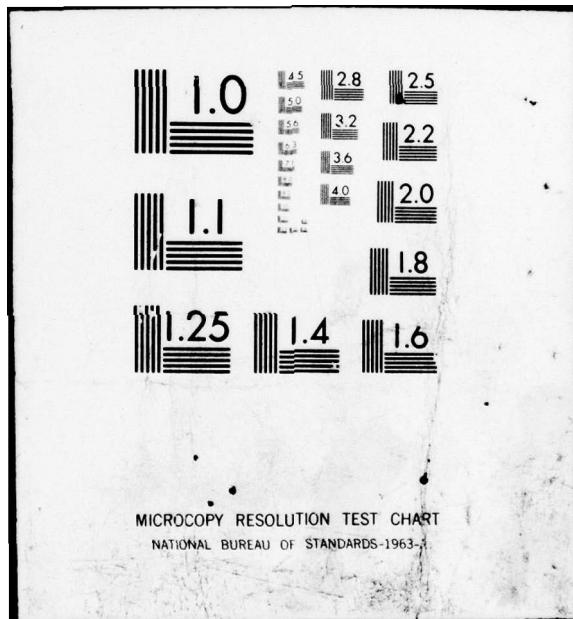
AD-A074 931 LETTERMAN ARMY INST OF RESEARCH SAN FRANCISCO CA F/G 6/8
SUMMARY OF FOOD MICROBIOLOGICAL DATA FROM THE CENTRAL FOOD PREP--ETC(U)
AUG 79 J T FRUIN, H F ALISHOUSE, A L DUNGAN

UNCLASSIFIED LAIR-74

NL

1 OF 1
AD
A074 931

END
DATE
FILMED
11-78
DDC



AD A 074931

INSTITUTE REPORT NO. 74

**SUMMARY OF FOOD MICROBIOLOGICAL
DATA FROM THE CENTRAL FOOD
PREPARATION SYSTEM EVALUATION
FORT LEE 1976 - 1978 D D C**

JOHN T. FRUIN, DVM, PhD, LTC, VC
HARVEL F. ALISHOUSE, DVM, MPH, MAJ, VC
AVALON L. DUNGAN, PhD, LTC, QM

**FOOD HYGIENE DIVISION
DEPARTMENT OF NUTRITION**

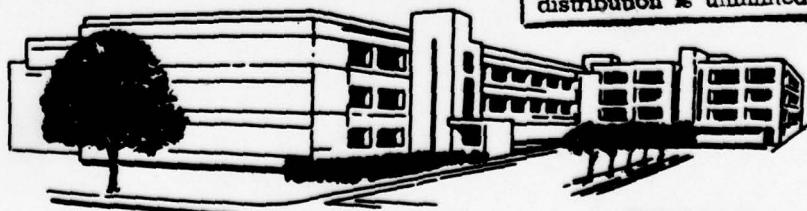
and

US ARMY, TROOP SUPPORT AGENCY
FORT LEE, VIRGINIA 23801

DOC FILE COPY

AUGUST 79

This document has been approved
for public release and sale; its
distribution is unlimited.



LETTERMAN ARMY INSTITUTE OF RESEARCH PRESIDIO OF SAN FRANCISCO CALIFORNIA 94129

REPRODUCTION OF THIS DOCUMENT IN WHOLE OR IN PART IS PROHIBITED EXCEPT WITH THE PERMISSION OF LETTERMAN ARMY INSTITUTE OF RESEARCH, PRESIDIO OF SAN FRANCISCO, CALIFORNIA 94129. HOWEVER, DDC IS AUTHORIZED TO REPRODUCE THE DOCUMENT FOR UNITED STATES GOVERNMENT PURPOSES.

DESTROY THIS REPORT WHEN NO LONGER NEEDED. DO NOT RETURN IT TO THE ORIGINATOR.

THE OPINIONS OR ASSERTIONS CONTAINED HEREIN ARE THE PRIVATE VIEWS OF THE AUTHORS AND ARE NOT TO BE CONSTRUED AS OFFICIAL OR AS REFLECTING THE VIEWS OF THE DEPARTMENT OF THE ARMY OR THE DEPARTMENT OF DEFENSE.

CITATION OF TRADE NAMES IN THIS REPORT DOES NOT CONSTITUTE AN OFFICIAL ENDORSEMENT OR APPROVAL OF THE USE OF SUCH ITEMS.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

(14) LAIR-74

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER LAIR Institute Report No. 74	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) SUMMARY OF FOOD MICROBIOLOGICAL DATA FROM THE CENTRAL FOOD PREPARATION SYSTEM EVALUATION FORT LEE 1976-1978.		5. TYPE OF REPORT & PERIOD COVERED Final Report, 1976-1978
6. AUTHOR(s) John T. Fruin, DVM, MPH, MAJ VC; Harvel F. Alishouse, DVM, MPH, MAJ VC; and Avalon L. Dungan, PhD, LTC QM		7. CONTROLLING OFFICE NUMBER
8. PERFORMING ORGANIZATION NAME AND ADDRESS Division of Nutrition Technology (SGRD-ULN) Letterman Army Institute of Research Presidio of San Francisco, CA 94129		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS Project 3M762772A811- Military Nutr. & Food Hyg. WU #004 - Military Food Hyg.
11. CONTROLLING OFFICE NAME AND ADDRESS US Army Medical Research and Development Command Fort Detrick Frederick, MD 21701		12. REPORT DATE 11 Aug 1979
13. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		13. NUMBER OF PAGES 30 (12) 35
		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) THIS DOCUMENT HAS BEEN APPROVED FOR PUBLIC RELEASE AND SALE: ITS DISTRIBUTION IS UNLIMITED.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) LAIR, Central Food Preparation Facility, Central Food Manager, Central Food Preparation System, Central Food Management System, Food Hygiene, food microbiology, military food hygiene, microbiological standards, food wholesomeness.		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) A food quality control laboratory was established to assess the wholesomeness of food items prepared under the Fort Lee, Virginia, Central Food Preparation System (CFPS). The CFPS was a concept of centralized preparation, storage, and delivery of foods to unit dining facilities. Unit level food service provided final preparation and serving of these foods.		

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

404912 Jroc

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

20. More than 4000 food samples were obtained at predetermined critical control points during production and delivered to the laboratory. Special discretionary sampling occurred when problems were identified during routine sampling or as the consequence of analytical results. Analyses were conducted in accordance with normal laboratory procedures to determine aerobic plate, coliform, Clostridium perfringens, Staphylococcus aureus, Escherichia coli, Salmonella, and yeast and mold counts. No Salmonellae were isolated. Of the samples tested, 1.5% contained more than 100/g S. aureus and 4.9% contained more than 100/g C. perfringens. One hundred and sixty eight samples were E. coli positive.

The laboratory identified many lots of food for further testing and for review of production procedures. Three potentially serious public health hazards were found and corrective actions were taken to preclude their recurrence. One involved the use of equipment constructed so that proper sanitization was impossible. The other two were production practices. Laboratory monitoring of mass centrally prepared food items was demonstrated as not only feasible but essential to assure wholesomeness.

The Medical Advisory Committee suggested microbial guidelines and procedures for centrally prepared foods. The committee recommendations were based on sound epidemiological principles, the data collected at CFPS, and current food wholesomeness philosophy.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

ABSTRACT

A food quality control laboratory was established to assess the wholesomeness of food items prepared under the Fort Lee, Virginia, Central Food Preparation System (CFPS). The CFPS was a concept of centralized preparation, storage, and delivery of foods to unit dining facilities. Unit level food service provided final preparation and serving of these foods.

More than 4000 food samples were obtained at predetermined critical control points during production and delivered to the laboratory. Special discretionary sampling occurred when problems were identified during routine sampling or as the consequence of analytical results. Analyses were conducted in accordance with normal laboratory procedures to determine aerobic plate, coliform, Clostridium perfringens, Staphylococcus aureus, Escherichia coli, Salmonella, and yeast and mold counts. No Salmonellae were isolated. Of the samples tested, 1.5% contained more than 100/g S. aureus and 4.9% contained more than 100/g C. perfringens. One hundred and sixty eight samples were E. coli positive.

The laboratory identified many lots of food for further testing and for review of production procedures. Three potentially serious public health hazards were found and corrective actions were taken to preclude their recurrence. One involved the use of equipment constructed so that proper sanitization was impossible. The other two were production practices. Laboratory monitoring of mass centrally prepared food items was demonstrated as not only feasible but essential to assure wholesomeness.

The Medical Advisory Committee suggested microbial guidelines and procedures for centrally prepared foods. The committee recommendations were based on sound epidemiological principles, the data collected at CFPS, and current food wholesomeness philosophy.

Accession For	NTIS GRA&I	DDC TAB
Unannounced	Justification	
By		
Distribution		
Availability Codes		
Dist	Avail and/or special	
A		

PREFACE

The authors wish to express appreciation to LTC Robert Howarth for the development of sampling plans, critical control points, establishment of laboratory procedures, and microbial guideline criteria.

The authors also wish to express appreciation to Miss Anne Regh for preparation of the typescript.

Author Alishouse's current address is US Army Medical Activity, Fort Huachuca, Arizona. Author Dungan's current address is HQDA, Office of the Department Chief, Research Development and Acquisitions, ATTN: DAMA-CSS-D/LTC Avalon Dungan, Washington, DC 20310.

TABLE OF CONTENTS

	<u>Page</u>
Abstract	i
Preface	ii
Table of Contents	iii
BODY OF REPORT	
INTRODUCTION	1
MATERIALS AND METHODS	3
RESULTS AND DISCUSSION	3
CONCLUSIONS	11
RECOMMENDATIONS	11
REFERENCES	12
Appendix	13
Glossary of Terms and Abbreviations	28
Distribution List	29

INTRODUCTION

It is the responsibility of the Department of Army (DA) to provide prepared, nutritionally adequate, wholesome meals to active duty personnel in garrison. Maintenance of dining facilities at the unit level requires the expenditure of considerable resources. DA established the Central Food Preparation System (CFPS) at Fort Lee, Va. in an attempt to integrate modern prepared food industry resource management and technology into the garrison feeding system while retaining the current nutritional and wholesomeness standards at a minimum (1,2).

From a wholesomeness standpoint, the key operating elements of the CFPS were the Ingredient Preparation Area (IPA), Central Food Preparation Facility (CFPF), Technical Support Office (TSO), Troop Issue Subsistence Activity (TISA), Satellite Dining Facilities (SDF), and the Pilot Kitchen. Briefly, the functions of these elements were as follows. a) The IPA was concerned with the tempering and cutting of meats, the weighing and measuring of ingredients, and the washing, cutting, and packaging of vegetable items. Items handled in this area were either prepared for direct delivery to the dining facilities (i.e., tempered meats, sliced luncheon meats, or salad items) or sent to the ingredient staging area of the CFPF for further processing. Raw ingredients for some items, such as salisbury steak and meatballs, were mixed and formed in the IPA before they were forwarded to the CFPF. b) CFPF was established for the preparation of food items which required personnel with advanced cooking skills or high labor capability and intensive preparation techniques were routinely required. Selected menu items were prepared for inventory in sufficient quantities to assure economic production and inventory levels in support of projected headcount and preference ratios. Foods prepared at CFPF were held under controlled temperatures and subsequently issued to SDFs for finishing and serving to authorized personnel. The CFPF was composed of the following areas: ingredient staging; dessert production; entree production; portioning and packaging; and storage. Its capacity was designed to produce at least 9,000 meals per day. Certain menu items were completely processed and packaged within the CFPF so the only subsequent actions required at the SDFs were heating (when appropriate), garnishing and serving. Other items were partially processed so that a few simple additional steps at the SDFs produced a finished menu item (i.e., salads). Certain items continued to be delivered directly to dining facilities for preparation under the conventional garrison system (i.e., hamburgers, brown and serve rolls, eggs, and steaks). c) The

1. Fruin, J.T. et al, Report No. 54, Presidio of San Francisco, California: Letterman Army Institute of Research, July 1978
2. US Army Troop Support Agency, Evaluation Report, Fort Lee, Virginia, December 1978

TSO had operational control of Medical Department Activity personnel in the form of a Quality Control/Microbiology Laboratory Team (QC/MLT). This team and an Internal Sanitation Team (IST) assisted in providing the troops with food items that met wholesomeness, nutritional, and quality standards. The TSO also assisted in maintaining acceptable safe working environments in and around the CFPS facilities. d) The SDF made final preparations and served the completed meals to the troops. There were 13 SDFs with designed capacities ranging from 120 to nearly 800 in CFPS. e) The TISA performed troop issue, subsistence accounting and requisitioning, and conducted receipt, storage, and issue functions. The TISA supplied raw food materials to the IPA for scaling and subsequent issue to the CFPF. After preparation, the finished products were transferred from the CFPF into the TISA's inventory for subsequent issue to the SDF. f) The Pilot Kitchen was used to provide the following: refinement/development of production operating guides and formulations without disrupting the regular or full-scale production runs in the CFPF; limited CFPF backup in the event of equipment malfunction; and preparation of entree items subject to deterioration during summer months when the temperature in the Central Kitchen becomes a critical factor (unlike the CFPF, the Pilot Kitchen had a temperature controlled environment) (2).

During the formulation of the CFPS concept, Army planners recognized that potential food wholesomeness or nutritional problems could result from major changes in the conventional garrison feeding system. A Medical Advisory Committee (MAC) was formed to assist in the development of operational plans and concepts. The MAC consisted of member physicians, veterinarians, dietitians and selected specialists requested as needed, i.e. the Surgeon General's Consultants in nutrition and in food hygiene were ad hoc members of the committee. The MAC made recommendations regarding the formation and the staffing of the Quality Control/Microbiology Laboratory Team as well as evaluating available facilities to house the laboratory. The MAC also made recommendations regarding operational procedures, frequency of laboratory testing, and the establishment of wholesomeness criteria. The MAC functioned as a key element in the CFPS concept from a food wholesomeness and nutritional standpoint.

Much of the same centrally prepared food production technology used in the CFPS is being applied in the new Walter Reed Army Medical Center (WRAMC). "Prepared" food production concepts have met with considerable success in many commercial ventures; normally the number of menu items is quite limited. Likewise wholesomeness and quality assurance criteria are limited. CFPS at Ft. Lee and the new feeding system at WRAMC have the responsibility for providing the total ration, thus menu diversification is essential. Since most menu items require their own unique production, shipping, storage and final preparation instructions, the complexity of wholesomeness and quality assurance criteria is increased and, likewise, the preventive medicine surveillance effort is enhanced. Consequently, the larger and more complete the microbiological data base for each food item, the more realistically

developed the microbial guidelines or criteria can be.

This report will present in tabular form the food microbiological surveillance data collected over a three year period, discuss these data compared to CFPS criteria, and discuss significant events as related to food hygiene.

MATERIALS AND METHODS

Sample Collection: Food samples were aseptically collected from a statistically determined number of finished product containers, (MIL-STD-105D sample plan S1 or S2, depending upon food item) (3,4). Additional samples were collected during processing and preparation at critical control points specified in CFMF HAD 75-01 (3), and at specific points determined by the sample collector. Samples were maintained in a chilled state prior to delivery to the laboratory and initiation of analysis.

Preparation of Food Homogenate: A 100 g portion was aseptically removed from each sample. Fifty grams were weighed into a sterile blender and 450 ml of sterile phosphate buffered water added. The combined sample and diluent were blended together for 2 minutes. The remaining 50 g portion was placed in 450 ml of lactose broth for Salmonella pre-enrichment and shaken to prepare the homogenate (3).

Isolation, Identification and Counting Procedures: The procedures given in the Food and Drug Administration's Bacteriological Analytical Manual (5) for the isolation and identification of Escherichia coli, Salmonella, Staphylococcus aureus, and Clostridium perfringens and for coliform counts, aerobic plate counts, and yeast and mold counts were followed (1).

RESULTS AND DISCUSSION

From the onset of operation, in early 1976, the microbiological content of food samples from the Pilot Kitchen was analyzed by the Quality Control/Microbiology Laboratory Team (QC/MLT). During November and December of 1977, while the CFPF was completed, staffed, personnel trained, and equipment checked, the QC/MLT remained quite active in collecting food samples and conducting environmental surveys. In January and February of 1978, serious production began and the formal CFPS evaluation was conducted from March to October 1978.

3. US Army Troop Support Agency, Laboratory Procedures Manual Number HAD 75-01, Fort Lee, Virginia, November 1974
4. Department of Defense. Military Standard 105D. Washington, DC, April 1963, and Change 1, March 1964
5. Food and Drug Administration, Bacteriological Analytical Manual for Foods. Washington, DC: US Department of Health, Education and Welfare, Public Health Service, Division of Microbiology, 1971

During the period of the evaluation, more than 4000 individual samples representing 198 different foods from 18 food classifications were analyzed to determine the microbiological content. From the start of production, in early 1976 through the end of 1978, the following numbers of analyses were performed: 3803 aerobic plate counts (APC), 3907 coliform most probable number (MPN) determinations, 3886 S. aureus MPN determinations, 2219 E. coli MPN, 1649 Salmonella determinations and 692 C. perfringens counts.

Interim microbiological guidelines were established for CFPS in 1974 (3). Four guideline categories were formulated for the different food classifications, based on expected microbial counts and history of involvement in food-borne disease outbreaks. The guidelines were formulated by using the sample size and rejection number specified in MIL-STD-105D (4) for sampling plan S1 or S2, the choice of which was dependent upon the food item being tested. The four CFPF guideline criteria were: (a) precooked vegetables, red meats, poultry, entrees, salad ingredients, gravies and soups: negative for E. coli/g and an APC of not more than 100,000/g; (b) desserts (ready to eat puddings and cream-type pies): negative for E. coli/g and an APC of not more than 50,000/g; (c) vegetable salads (raw vegetables only): negative for E. coli/g and an APC of not more than 10,000,000/g; (d) prepared sandwiches: components conform to applicable guidelines (a) or (c) above.

For foods in all food categories, except raw vegetables, trigger criteria for APCs and fecal coliforms in excess of 10,000/g and 3.6/g, respectively, were prescribed. When the trigger criteria were exceeded, the following additional analyses and guidelines were supplied: Salmonella - negative/25 g; C. perfringens - not more than 1,000/g; and S. aureus (coagulase positive) - not more than 100/g (3).

When a food was found to exceed the guidelines, the lot was immediately placed on hold. The laboratory then would retest the lot to confirm the original findings. If the original findings appeared to be in error, i.e., the retest did not reveal any problems, the lot would be released for consumption without further action. If, however, the retest confirmed the original findings, the Deputy for Veterinary Activities was asked to review the findings and to recommend action deemed appropriate, i.e., clear, rework or condemn. Further actions taken when the retest confirmed that the guidelines were exceeded included a comprehensive review of the product operational guide, analysis of raw components, and a detailed examination of production procedures. These actions were all aimed at locating the cause(s) of high microbial counts and correction of the problem for subsequent production lots (2).

In actual practice the sampling of food items did not rigidly adhere to the procedure set forth in the Laboratory Procedure Manual (3). After sample collectors and laboratory technicians became experienced, they developed their own system of collecting and analyzing products.

The specific analyses, i.e., Salmonella, C. perfringens, and S. aureus, called for only when "trigger" criteria were exceeded were conducted with considerable frequency. In fact, most samples were analyzed for S. aureus, about 40% for Salmonella, and about 20% for C. perfringens. From the standpoint of overall efficiency, the system developed and implemented was quite good. However, some criticism of the failure to submit samples exceeding criterion and trigger values for further testing is due. For example, a total of 119 and 275 pork samples exceeded the APC and coliform trigger criteria, respectively, but only 66 were analyzed for C. perfringens. By making the conservative but highly unlikely assumption that all of the 119 samples exceeding the APC trigger criteria also exceeded the coliform criteria, at least 209 additional samples should have been analyzed for C. perfringens, and 142 samples for Salmonella.

The data by food and analysis are shown in Table 1. These same data shown in Table 1 are summarized by food classification in Table 2 for ease of review. Table 3 lists the number of samples, by food classification, which exceeded the microbial guidelines and trigger criteria, it also lists other significant results. Table 4 provides a listing of yeast and mold counts, by food item.

The only bakery product with an excessively high APC was one sample of peach pie, which represents 2% of all bakery products tested. One blueberry pie sample also exceeded the trigger limits. No direct explanation for the high counts of these two samples can be gleened from the laboratory reports. However, based on first-hand observations of the CFPF by one of the authors (Fruin) during a day of maximum production, the blast freezer was unable to accommodate the entire day's production. As a result a large portion of the production, including unprotected pies, was placed in the holding freezer, which was not capable of handling either the heat or moisture load. It could be speculated that such a situation of inadequate cooling, permitted microbial growth and/or possibly contamination by dripping condensation.

A total of 26 samples of cooked beef items, 3.5% of all samples, exceeded the APC guidelines. Samples exceeding the guidelines were either, chicken fried patties, roast, steaks, or stew. The majority of the samples exceeding the coliform trigger criteria were also from those four food items. All beef samples with S. aureus or C. perfringens exceeding 100/g were roasts. One sample had a S. aureus count of 190,000/g. Beef items positive for E. coli were chicken fried patties, meat loaf, roast and meatballs. Because of its sensitivity to heat, E. coli contamination is normally presumed to be the result of post preparation contamination. High aerobic plate, S. aureus and C. perfringens counts were probably due to bacterial growth resulting from improper or inadequate chilling after cooking. During a site visit, one of the authors (Fruin), observed the preparation of Swedish meatballs. Due to some equipment failure and management error, the meat balls, after cooking, were held at room temperature for a number

of hours before being manually placed in disposable aluminum containers with a measured amount of gravy. The gravy had been prepared in a steam-jacketed kettle and transferred into movable stainless steel tubs with a capacity of several hundred quarts. The gravy remained in the tubs at ambient temperature for several hours, the temperature never falling below 160°F. However, the temperature of the meat balls declined slowly to a room temperature of 75-80°F. Laboratory records for that particular lot of Swedish meatballs indicated APCs of less than 1,000/g and S. aureus and C. perfringens counts of less than 100/g. In this incident the high gravy temperature may have reduced the bacterial counts when poured over the meatballs. Although no health hazards were identified, this incident provides a basis for speculation about the reasons for high bacterial counts appearing elsewhere in this report and for which no reasons were indicated by the laboratory.

The microbial content of raw beef was within normal limits. All isolations of E. coli were from raw ground beef. The grinding process is notorious for dispersing the surface microbial flora throughout a product. Grinding also increases surface area and permits greater oxygenation.

The high incidence of E. coli isolated from cheese was traced to a mechanical food slicing machine which could not be dismantled for proper sanitization. The machine was taken out of service, the manufacturer was notified, and an unsatisfactory material report was filed to preclude future DOD purchase of the item. Prompt investigative action by QC/MLT personnel prevented what could have resulted in recurring massive outbreaks of food-borne illness. This incident supports the need for routine microbiological analyses in large-scale, centrally prepared food facilities.

Only 1 and 14 of 82 chili samples exceeded the APC guideline and trigger levels, respectively. One sample was E. coli positive. The high APC counts are most likely due to bacterial growth during the time lag prior to entering the blast freezer. The presence of E. coli can probably be attributed to post cooking contamination.

Luncheon meat samples were restricted to pickle and pimiento loaf, and thus must be classified as a cultured product having no APC or trigger criteria. The one sample tested had a S. aureus count greater than 100/g but less than 1,000/g. This is neither unexpected nor excessively high.

Only one food sample (chocolate ice cream), from the miscellaneous classification failed to pass the APC guidelines. Six samples exceeded the APC trigger value. The chocolate ice cream sample also exceeded the coliform trigger value and was E. coli positive. Chocolate, as a raw ingredient, is frequently contaminated and therefore requires persistent surveillance to assure acceptable bacterial quality. Four other samples exceeded the coliform trigger value, two of which were

positive when tested for E. coli. One sample, ham and cheese omelet, had greater than 100/g S. aureus.

Pork samples tested had 6.2% exceeding the APC guideline, and 17.9% and 41.0% exceeding the APC and coliform trigger criterion, respectively. Of the 41 samples exceeding the APC guideline, 31 were either sliced or diced ham and the remaining 10 were pork roast. Sliced and diced ham accounted for the bulk of the pork samples that exceeded the trigger criteria. These products are cured, remain in cold storage for long periods, for the most part are not heated in CFPF, and were subjected to contamination because of the extensive amount of handling. Twenty six of 87 samples of pork roast had greater than 100/g S. aureus and 22 of 31 samples had greater than 100/g C. perfringens, the highest count being 57,000/g for C. perfringens. A number of production lots were placed in hold status and subsequently reworked, cleared, or condemned. After the QC/MLT identified this problem, investigation disclosed that the high counts occurred during tests to determine maximum production capacity of CFPF. Production personnel were unable to complete processing the item within their 8 hour shift and in an effort to hold down labor costs overtime payments were not permitted. In reconstructing the events that led to high bacterial counts, on at least one occasion, it was observed that after being cooked, the product was held at room temperature for an undetermined period of time. Next, 400 to 500 pounds of roast were placed in a stainless steel tub and held in a -20°F freezer for overnight storage. The next morning, prior to processing, the temperature of the roast in the interior of the tub was 85°F, thus ideal growth conditions for both S. aureus and C. perfringens had existed for several hours. Theoretically, enormous bacterial populations could have developed during that incubation period. CFPF management took corrective action to limit the time cooked items could be held unrefrigerated and made the appropriate restrictions regarding how items were to be refrigerated. Here, again, the supporting microbiological laboratory proved its value by identifying the potential hazards prior to an outbreak of food-borne illness.

Poultry represented the meat food classification with the lowest percentage of samples exceeding the APC guideline. The number of samples exceeding the trigger criteria for APC and coliform counts was low, no samples had greater than 100/g S. aureus or C. perfringens and no samples were E. coli positive.

Salad samples were also of high quality with regard to APC. Less than 10% of all samples analyzed were positive for E. coli. However, 60 of 63 cole slaw samples were positive, thus only 9 of the remaining fresh salad samples contained E. coli, which is lower than expected. No epidemiological reason for the high incidence of E. coli in cole slaw was presented.

No explanation is presented for the large number (29.7%) of sandwich samples exceeding the coliform trigger criteria. One sample

in 44 had greater than 100/g S. aureus, which is not unexpected for these products.

Sauces, soups and toppings presented no results of public health significance.

Sausage products have a long shelf life and are often susceptible to psychotrophic bacterial growth. Thus the 31 bologna samples with APCs greater than the guidelines were presumed to be the result of harmless psychotrophic growth and not considered to be of public health significance.

The only seafood sample exceeding the APC guidelines was tuna and noodles. Eight of the 9 samples exceeding APC trigger criterion were tuna and noodles. When one considers the type of food item, i.e., casserole which takes considerable time to heat and cool, these results were not unexpected. However, the production procedures for this product should be reviewed and revised.

All 5 of the veal samples exceeding the APC guidelines were ground veal as were 8 of the 9 samples exceeding the coliform trigger criterion. Veal has a reputation for carrying a high level of contamination. However, cooking should be sufficient to reduce this contamination to an insignificant level. No explanation for these high bacterial counts are presented. Seven samples of veal were E. coli positive.

Fourteen vegetable samples exceeded the APC guideline while 32 exceeded the trigger criterion. There were 17 samples exceeding the coliform trigger criteria. No other significant results were reported.

Near the end of the CFPS evaluation period the MAC was consulted by Fort Lee Veterinary activity personnel for advice regarding the high C. perfringens counts in roast pork. A MAC review of sampling procedures and microbiological guidelines set forth in the laboratory procedures manual (3), the microbiological data collected, and current literature regarding microbial standards resulted in a number of new recommendations for CFPS and the centrally prepared dietary menus at WRAMC. The sampling plan from MIL-STD-105D (4) was replaced by a fixed sample size of 5. Samples were collected aseptically in portions of 100 g or more taken one at the start and one at the end of production and the remaining 3 collected randomly. Specific microbial analyses were to be done in accordance with the Compendium of Methods for the Microbiological Examination of Food (6); these included APC, E. coli MPN, S. aureus MPN, C. perfringens count and Salmonella spp. 25 g

6. Speck, M.L. (Editor). Compendium of Methods for the Microbiological Examination of Foods. Washington, D.C.: American Public Health Association, 1976

preenrichment method. Referral of the lot to the medical activity for disposition occurred as follows:

<u>Analysis</u>	<u>Refusal Criteria, Case 1</u>	<u>Refusal Criteria, Case 2</u>
APC	2 samples $> 10^5$ /g	1 sample $> 10^6$ /g
<u>E. coli</u> (MPN)	" " > 3 /g	" " $> 10^2$ /g
<u>S. aureus</u> (MPN)	" " > 10 /g	" " $> 10^3$ /g
<u>C. perfringens</u>	" " $> 10^2$ /g	" " $> 10^3$ /g
<u>Salmonella</u> spp.	if positive/25 g	Same as case 1

Special consideration must be made for high count items, i.e., those containing cultured products, fresh fruit, vegetables, raw meat, etc.

The CFPS Evaluation Report (2) recommended the CFPS concept be abandoned principally because it failed to compete on an economic basis with the conventional garrison feeding system. The report made a number of noteworthy conclusions regarding the public health aspect of CFPS:

"a. Large scale centralized food preparation poses a significant health risk to diners unless positive steps are taken to control wholesomeness.

b. It is possible to control the risk of food-borne illness in a large scale food preparation system.

c. Timely and accurate laboratory results are required prior to the issue of centrally prepared foods as a final safety measure.

d. The continuous presence of an independent authority is required to assure that good manufacturing practices, as pertain to public health, are not subverted in the interest of attaining production goals"(2).

The report went on to make the following recommendations:

"a. The responsible medical authority should have full-time inspection coverage of the central facility.

b. The responsible medical authority should have the authority to cause the full and immediate cessation of any production activity that could or does result in an unwholesome end item, to include denying the use of unsanitary areas, equipment, or utensils.

c. The medical authority should be responsible for the selection of samples for microbiological analysis, for making the analysis, and for interpreting the results, as well as for establishing the standards to be applied.

d. The medical authority should have access to fast and accurate laboratory support in order to ascertain the microbiological quality of each product lot prior to the release of that lot for consumption. In some geographic locations, this requirement can only be fulfilled with in-house laboratory capabilities.

e. The operator of the Central Preparation System should have no influence over the determination of wholesomeness but should abide by the decision of the medical authority"(2).

CONCLUSIONS

In addition to the conclusions presented in the CFPS Evaluation Report (2) the following conclusions, specifically related to the QC/MLT, are presented:

- a) The QC/MLT demonstrated its ability to identify hazardous food items prior to their consumption. b) The QC/MLT was an essential organizational element in the CFPS.

RECOMMENDATIONS

The following are in addition to the recommendations of the CFPS Evaluation Report (2):

- a) Any mass military feeding system, utilizing central preparation, should have microbiological laboratory facilities available and those laboratory facilities should be tasked to provide support similar to that provided CFPS by the MLT. b) Any laboratory data generated in support of central preparation kitchens should be put in a data bank for use as reference data or for establishing microbiological criterion.

REFERENCES

1. FRUIN, J.T., H.F. ALISHOUSE, and A.L. DUNCAN. Collection of Food Microbiological Data From the Central Food Preparation Facility Pilot Kitchen - 1976. Report No. 54. Presidio of San Francisco, California: Letterman Army Institute of Research, July 1978
2. US ARMY TROOP SUPPORT AGENCY. Evaluation Report, Central Food Preparation System. Fort Lee, Virginia, December 1978
3. US ARMY TROOP SUPPORT AGENCY. Central Food Management System, Laboratory Procedures Manual. Number HAD 75-01. Fort Lee, Virginia, November 1974
4. DEPARTMENT OF DEFENSE. Military Standard 105D. Sampling Procedures and Tables for the Inspection by Attributes. Washington, D.C., April 1963 and Change 1, March 1964
5. FOOD AND DRUG ADMINISTRATION. Bacteriological Analytical Manual for Foods. Washington, D.C.: US Department of Health, Education and Welfare, Public Health Service, Division of Microbiology, 1971
6. SPECK, M.L. (Editor). Compendium of Methods for the Microbiological Examination of Foods. Washington, D.C.: American Public Health Association, 1976

LIST OF TABLES

	<u>Page</u>
Table 1: Microbial Results of Analyzing Foods Prepared by the Central Food Preparation System	14-24
Table 2: Microbiological Results by Food Classification of Foods Prepared by the Central Food Preparation System	25
Table 3: The Number of Food Samples, Listed by Food Classification, Which Failed to Meet Guideline Criteria When Analyzed for Aerobic Plate Count (APC) and Coliform Count (CC)	26
Table 4: Yeast and Mold Counts of Food Samples Produced by the Central Food Preparation System	27

APPENDIX

TABLE I: Microbiological results of analyzing foods prepared by the Central Food Preparation System

FOOD ITEM	Aerobic Plate Count/ cm^2						Coliforms/ cm^2											
	$\leq 10^2$	10^2 - 10^3	10^3 - 10^4	10^4 - 10^5	10^5 - 10^6	10^6 - 10^8	≤ 10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	>100	
<u>BAKERY PRODUCTS</u>																		
Apple Pie	4	3	0	1	0	0	0	5	5	5	0	0	0	0	0	0	0	0
Banana Cream Pie	1	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Blueberry Pie	7	6	0	0	1	0	0	7	4	0	0	0	0	0	0	0	0	2
Brownies	2	2	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0
Butterscotch Brownies	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Cherry Pie	3	3	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0
Chocolate Cream Pie	3	0	0	3	0	0	0	3	3	0	0	0	0	0	0	0	0	0
Coconut Cream Pie	4	2	1	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0
Cream Pie	1	1	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0
Danish Pastry	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Doughnuts	6	4	1	1	0	0	0	6	3	0	0	0	0	0	0	0	0	2
Jelly Roll	2	1	1	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0
Lemon Jelly Roll	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Lemon Pie	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Peach Pie	7	1	4	1	0	0	1	7	5	0	0	0	0	0	0	0	0	0
Pineapple Cake	1	1	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0
Pineapple Pie	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pumpkin Pie	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Raisin Pie	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Yellow Cake, Maple Icing	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
<u>BEFF COOKED</u>																		
BBQ, All	37	24	8	4	1	0	0	37	36	0	0	1	0	0	0	0	0	0
Braised	31	24	4	1	2	0	0	31	31	0	0	0	0	0	0	0	0	0
Chicken Fried Patties	49	5	3	16	15	4	1	50	38	0	2	1	1	0	0	0	0	3
Corned Hash	49	27	14	7	1	0	0	49	43	2	0	0	0	1	0	0	0	0
Creamed Ground	8	8	0	0	0	0	0	8	8	0	0	0	0	0	0	0	0	0
Meat Balls	53	42	4	6	1	0	0	53	52	0	0	0	0	0	0	0	0	1
Meat Loaf	58	13	22	21	2	0	0	55	53	0	0	1	0	0	0	0	1	0
Noodles	69	7	36	24	2	0	0	69	56	5	0	1	0	0	1	0	0	0
Pot Pie	1	0	1	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0
Roast	221	70	72	42	23	14	0	1	1	0	0	0	0	2	1	0	0	4
Steaks	108	46	23	23	10	6	0	90	180	4	5	0	0	0	0	0	0	19
Stew	47	28	15	3	0	1	0	47	46	0	0	0	0	0	0	0	0	2
Stuffed Roll	4	1	2	1	0	0	0	4	4	0	0	0	0	0	0	0	0	1
<u>BEFF ROLL</u>																		
Ground	9	2	0	0	3	1	0	3	7	0	0	0	1	0	0	0	0	2
Meat Balls	3	0	0	1	1	0	0	4	0	0	0	1	0	0	0	0	1	2
Meat Loaf	20	0	1	2	9	8	0	19	1	0	0	2	0	0	0	0	0	14
Stew	2	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1
Stuffed Roll	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

TABLE 1: Microbiological results of analyzing foods prepared by the Central Food Preparation System (Cont)

FOOD ITEM	<u>S. aureus</u> Count/			<u>C. perfringens</u> Count/			<u>Salmonella</u>			<u>E. coli</u>		
	N	<100	≥100	N	<100	≥100	N	POS	NFC	N	POS	NFC
<u>BAKERY PRODUCTS</u>												
Apple Pie	4	4	0	0	-	-	1	0	1	1	0	1
Banana Cream Pie	1	1	0	0	-	-	0	1	0	0	-	-
Blueberry Pie	7	7	0	0	-	-	0	-	0	0	-	-
Brownies	2	2	0	0	-	-	0	-	0	0	-	-
Butterscotch Brownies	0	-	-	0	-	-	0	-	0	0	-	-
Cherry Pie	2	2	0	0	-	-	0	-	0	0	-	-
Chocolate Cream Pie	3	3	0	0	-	-	3	0	3	2	0	2
Coconut Cream Pie	4	4	0	0	-	-	4	0	4	0	-	-
Cream Pie	2	2	0	0	-	-	2	0	2	1	0	1
Danish Pastry	1	1	0	0	-	-	0	-	0	0	-	-
Doughnuts	4	4	0	0	-	-	0	-	0	0	-	-
Jelly Roll	1	1	0	0	-	-	0	-	0	0	-	-
Lemon Jelly Roll	1	1	0	0	-	-	0	-	0	0	-	-
Lemon Pie	1	1	0	0	-	-	0	-	0	0	-	-
Peach Pie	7	7	0	0	-	-	1	0	1	0	-	-
Pineapple Cake	2	2	0	0	-	-	0	-	0	0	-	-
Pineapple Pie	1	1	0	0	-	-	0	-	0	0	-	-
Pumpkin Pie	1	1	0	0	-	-	0	-	0	0	-	-
Raisin Pie	1	1	0	0	-	-	1	0	1	0	-	-
Yellow Cake, Maple Icing	1	1	0	0	-	-	0	-	0	0	-	-
<u>MEAT COOKED</u>												
Bbq, All	37	37	0	15	15	0	32	0	32	19	0	19
Braised	31	31	0	21	21	0	31	0	31	25	0	25
Chicken Fried Patties	49	49	0	5	5	0	43	0	43	39	11	28
Corned	46	46	0	28	28	0	43	0	43	38	1	37
Corned, Hash	8	8	0	0	-	-	8	0	8	0	-	-
Creamed Ground	52	52	0	18	18	0	51	0	51	12	0	12
Meat Balls	58	58	0	29	29	0	54	0	54	38	1	37
Meat Loaf	69	69	0	33	33	0	56	0	56	44	4	40
Noodles	2	2	0	0	-	-	1	0	1	0	-	-
Pot Pie	1	1	0	0	-	-	1	0	1	1	0	1
Roast	216	202	14*	127	116	11	176	0	176	166	12	154
Steak	109	109	0	44	44	0	78	0	78	65	0	65
Stew	48	48	0	32	32	0	47	0	47	35	0	35
Stuffed Roll	4	4	0	4	4	0	4	0	4	1	0	1
<u>MEAT RAW</u>												
Ground	9	9	0	0	-	-	3	0	3	7	5	2
Meat Balls	13	13	0	2	2	0	10	0	10	5	1	4
Meat Loaf	21	19	2	0	-	-	5	0	5	16	10	6
Roast	2	2	0	0	-	-	2	0	2	1	0	1
Stew	1	1	0	0	-	-	1	0	1	1	0	1
Stuffed Roll	1	1	0	0	-	-	1	0	1	0	1	0

TABLE 1: Microbiological results of analyzing foods prepared by the Central Food Preparation System (Cont)

FOOD ITEM	N	Aerobic Plate Count/ \log_{10}						Coliforms/g													
		$<10^2$	10^2	10^3	10^4	10^5	10^6	10^7	10^8	N	≤ 10	20	30	40	50	60	70	80	90	>100	
<u>CHEESE</u>																					
American	3	2	0	1	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0
Cheddar	136	23	1	11	5	30	66	252	193	9	8	2	5	1	4	1	0	0	0	0	0
Mixed	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
Provolone	6	0	1	2	0	0	3	11	11	0	0	0	0	0	0	0	0	0	0	0	0
Swiss	16	8	0	3	0	0	0	16	12	0	1	0	0	0	0	0	0	0	0	0	0
<u>CHILI</u>																					
Chili	7	2	0	4	1	0	0	7	7	0	0	0	0	0	0	0	0	0	0	0	0
Con Carne	54	1	3	38	11	1	0	55	55	0	0	0	0	0	0	0	0	0	0	0	0
Macaroni	21	3	10	7	1	0	0	22	22	0	0	0	0	0	0	0	0	0	0	0	0
<u>LUNCHEON MEAT</u>																					
Pickle & Pimento	63	19	0	10	12	12	10	63	57	1	1	1	0	0	0	0	0	0	0	0	3
<u>MISCELLANEOUS</u>																					
Chocolate Ice Cream	1	0	0	0	0	1	0	1	0	14	14	0	0	0	0	0	0	0	0	0	1
Chop Suey	14	6	6	1	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0
Cloves, Ground	1	0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0
Corn Dog	1	0	0	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0
Corn Bread Dressing	5	1	3	1	0	0	0	0	6	6	6	0	0	0	0	0	0	0	0	0	0
Corn O'Brien	1	0	0	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0
Egg, Potato Patty & Bacon	1	0	0	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0
Franks & Beans	6	0	0	4	2	0	0	0	6	6	6	0	0	0	0	0	0	0	0	0	0
Franks, Cheese & Bacon	6	1	0	0	0	0	0	5	7	5	7	0	0	0	1	0	0	0	0	0	0
French Toast	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0
Gravy	34	15	6	11	2	0	0	0	35	35	0	0	0	0	0	0	0	0	0	0	0
Ham & Cheese Omelet	1	0	0	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0
Lasagna	39	16	9	6	3	5	2	41	40	1	1	0	0	0	0	0	0	0	0	0	0
Liver & Onions	1	0	0	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0
Macaroni & Cheese	17	1	3	3	4	5	1	0	19	18	0	1	0	0	0	0	0	0	0	0	0
Savory Bread Dressing	9	3	5	1	0	0	0	0	9	9	0	0	0	0	0	0	0	0	0	0	0
<u>PORK</u>																					
Bacon	19	15	0	4	0	0	0	19	19	0	0	0	0	0	0	0	0	0	0	0	0
Chops	7	4	2	0	1	0	0	8	8	0	0	0	0	0	0	0	0	0	0	0	0
Ham	9	8	0	1	0	0	0	9	9	0	1	0	0	0	0	0	0	0	0	0	0
Ham, Diced	277	95	43	76	40	22	1	286	128	15	15	15	11	9	7	7	5	4	0	7	85
Ham, Sliced	228	80	61	61	18	8	0	229	121	19	9	7	7	1	8	2	6	40	0	0	0
Ribs	30	17	3	2	8	0	0	26	26	0	0	0	0	0	0	0	0	0	0	0	0
Roast	64	8	26	10	10	8	2	64	57	3	1	0	0	0	0	0	0	0	0	0	0
Roast, Sliced	24	11	11	1	1	0	0	24	24	0	0	0	0	0	0	0	0	0	0	0	0
Sweet & Sour Pork	6	4	1	1	0	0	0	6	6	0	0	0	0	0	0	0	0	0	0	0	0

TABLE I: Microbiological results of analyzing foods prepared by the Central Food Preparation System (Cont)

FOOD ITEM	<u>S. aureus</u> Count/ <i>n</i>			<u>C. perfringens</u> Count/ <i>n</i>			<u>Salmonella</u>			<u>E. coli</u>		
	N <100	≥100	N	<100	≥100	N	N	POS	NEG	N	POS	NEG
<u>CHEESE</u>												
American	3	3	0	0	—	—	0	—	—	0	—	—
Cheddar	233	229	4	0	—	—	18	0	18	78	33	45
Mixed	1	1	0	0	—	—	0	—	—	0	—	—
Provolone	11	11	0	0	—	—	0	—	—	5	1	4
Swiss	16	16	0	0	—	—	0	—	—	2	0	2
<u>CHILI</u>												
Chili	7	7	0	5	0	—	6	0	6	6	0	6
Con Carne	55	55	0	38	38	0	55	0	55	40	1	39
Macaroni	22	22	0	3	3	0	21	0	21	9	0	9
<u>LUNCHEON MEAT</u>												
Pickle & Pimento Loaf	55	54	1	0	—	—	4	0	4	33	0	33
<u>MISCELLANEOUS</u>												
Chocolate Ice Cream	1	1	0	0	—	—	1	0	1	1	1	0
Chop Suey	14	14	0	9	9	0	11	0	11	10	0	10
Cloves, Ground	1	1	0	0	—	—	1	0	1	1	0	1
Corn Dog	1	1	0	0	—	—	1	0	1	0	—	—
Corn Bread Dressing	6	6	0	5	5	0	5	0	5	5	0	5
Corn O'Brien	1	1	0	0	—	—	1	0	1	0	—	—
Egg, Potato Patty, & Bacon	1	1	0	0	—	—	1	0	1	0	—	—
Franks & Beans	6	6	0	1	1	0	6	0	6	6	0	6
Franks, Cheese & Bacon	7	7	0	0	—	—	7	0	7	4	2	2
French Toast	1	1	0	0	—	—	0	—	—	0	—	—
Gravy	35	35	0	6	6	0	19	0	19	15	0	15
Ham & Cheese Omelet	1	0	1	0	—	—	1	0	1	0	—	—
Lasagna	41	41	0	23	23	0	41	0	41	28	0	28
Liver & Onions	1	1	0	0	—	—	0	—	—	0	—	—
Macaroni & Cheese	19	19	0	4	4	0	13	0	13	7	0	7
Savory Bread Dressing	9	9	0	4	4	0	9	0	9	6	0	6
<u>PORK</u>												
Bacon	19	19	0	0	—	—	0	—	—	11	0	11
Chops	8	8	0	2	2	0	8	0	8	5	0	5
Ham	7	7	0	0	—	—	4	0	4	1	0	1
Ham, Diced	275	270	5	0	—	—	1	0	1	170	4	166
Ham, Sliced	228	228	0	0	—	—	0	—	—	154	1	153
Ribs	30	30	0	11	11	0	30	0	30	20	0	20
Ribs	87	61	26	31	9	22*	63	0	63	61	3	58
Roast	24	24	0	19	18	1	23	0	23	20	0	20
Roast, Sliced	24	24	0	3	3	0	4	0	4	4	0	4
Sweet & Sour Pork	5	5	0	3	3	0	4	0	4	0	4	0

TABLE 1: Microbiological results of analyzing foods prepared by the Central Food Preparation System (Cont.)

FOOD ITEM	N	Aerobic Plate Count/B.					Coliforms/B.											
		10^2	10^3	10^4	10^5	10^6	10^7	10^8	10^9	10^10	10^11	20	30	40	50	60	70	
<u>POULTRY</u>																		
Chicken, BBQ	19	14	3	2	0	0	0	0	19	19	0	0	0	0	0	0	0	0
Chicken	6	3	2	1	0	0	0	0	6	6	0	0	0	0	0	0	0	0
Chicken, Cacciatore	19	17	1	1	0	0	0	0	19	19	0	0	0	0	0	0	0	0
Chicken, Fried	100	55	37	7	1	0	0	0	100	94	2	0	0	0	0	2	0	0
Chicken, Noodle	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
Chicken Parmesan	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chicken Pot Pie	1	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
Chicken, Savory Baked	30	12	5	3	7	3	0	30	24	0	0	0	0	0	0	0	0	0
Chicken, Steamed	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
Chicken Vega	1	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
Turkey Chow Mein	12	0	0	12	0	0	0	0	12	12	0	0	0	0	0	0	0	0
Turkey Pot Pie	2	0	2	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0
Turkey, Scalloped	28	3	11	14	0	0	0	28	26	1	1	0	0	0	0	0	0	0
Turkey, Sliced	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
<u>SALADS</u>																		
Banana Jello	10	7	2	0	2	0	0	0	10	10	0	0	0	0	0	0	0	0
Bean	2	0	0	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0
Cabbage & Carrot	4	0	0	0	0	1	0	0	1	4	0	0	0	0	0	4	1	0
Cabbage & Celery	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Carrot & Celery	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	21	0
Carrot & Raisin	39	6	0	7	20	5	1	39	12	0	3	0	0	0	0	1	9	0
Carrot, Raisin, & Celery	15	4	0	1	3	4	3	15	4	1	0	0	0	0	0	0	0	18
Chef	23	0	0	9	10	4	0	23	2	0	2	1	0	0	0	0	0	0
Cherry Jello	8	5	3	0	0	0	0	8	8	0	0	0	0	0	0	0	0	0
Cole Slaw	73	2	4	8	34	19	6	73	12	2	7	0	0	3	0	8	40	0
Cranberry, Pineapple	40	30	7	3	0	0	0	40	40	0	0	0	0	0	0	0	0	0
Fruit Cocktail	24	21	0	3	0	0	0	27	27	0	0	0	0	0	0	0	0	0
Fruit Cocktail Jello	7	5	1	0	1	0	0	7	7	0	0	0	0	0	0	0	0	0
Fruit Gelatin	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Garden	32	1	0	1	4	19	7	32	2	0	2	0	0	0	0	0	0	26
Golden Glow	46	28	14	3	1	0	0	46	46	0	0	0	0	0	0	0	0	0
Jellied Cherry	3	3	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0
Jellied Fruit Cocktail	5	4	1	0	0	0	0	4	3	0	0	0	0	0	0	0	0	0
Jellied Orange Pineapple	4	4	0	0	0	0	0	5	5	0	0	0	0	0	0	0	0	0
Jellied Pears	5	5	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Jellied Pineapple Pear	8	6	2	0	0	0	0	8	8	0	0	0	0	0	0	0	0	0
Jellied Strawberry Pineapple	2	1	1	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0
Jello	6	5	1	0	0	0	0	6	5	0	1	0	0	0	0	0	0	0
Lemon Jello	1	1	0	0	3	5	13	1	23	3	1	2	0	0	0	17	8	1
Lettuce	23	0	1	3	5	13	1	2	6	3	13	1	0	0	0	0	0	0
Lettuce & Cucumber	13	0	0	2	2	6	3	1	0	1	0	0	0	0	0	0	0	1
Lettuce & Onion	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lettuce & Tomato	6	2	0	0	1	0	0	3	6	3	0	0	0	0	0	0	1	0
Meat & Cheese	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE I: Microbiological results of analyzing foods prepared by the Central Food Preparation System (Cont.)

FOOD ITEM	<i>S. aureus</i> Count/ μ			<i>C. perfringens</i> Count/ μ			<i>Salmonella</i>			<i>E. coli</i>		
	N <100	≥100	N	<100	≥100	N	POS	NFG	N	POS	NEG	
<u>POULTRY</u>												
Chicken, BBQ	19	19	0	18	18	0	19	0	19	15	0	15
Chicken	6	6	0	0	—	0	3	0	3	2	0	2
Chicken Cacciatore	19	19	0	15	15	0	18	0	18	15	0	15
Chicken, Fried	100	100	0	25	25	0	97	0	97	83	0	83
Chicken, Noodle	1	1	0	0	—	0	—	0	—	0	—	0
Chicken Parmesan	1	1	0	1	1	0	1	0	1	1	0	1
Chicken Pot Pie	1	1	0	0	—	1	0	1	0	0	—	0
Chicken, Savory Baked	30	30	0	1	1	0	29	0	29	24	0	24
Chicken, Steamed	1	1	0	0	—	1	0	1	0	0	—	0
Chicken Vega	1	1	0	0	—	0	—	0	—	1	0	1
Turkey Closs Melt	12	12	0	8	3	0	12	0	12	9	0	9
Turkey Pot Pie	2	2	0	0	—	1	0	2	0	0	—	0
Turkey, Scallopine, ^d	28	28	0	3	8	0	27	0	27	25	0	25
Turkey, Sliced	1	1	0	0	—	0	—	0	—	1	0	1
<u>SALADS</u>												
Banana Jello	10	10	0	0	—	0	0	—	0	0	—	0
Bean	2	2	0	0	—	0	—	—	—	1	0	1
Cabbage & Carrot	4	4	0	0	—	0	—	—	—	4	0	4
Cabbage & Celery	1	1	0	0	—	0	—	—	—	1	0	1
Carrot & Celery	1	1	0	0	—	0	—	—	—	1	0	1
Carrot, Raisin & Celery	36	35	1	0	—	0	—	—	—	32	0	32
Carrot, Raisin, & Celery	15	15	0	0	—	0	—	—	—	13	1	12
Chef	23	23	0	0	—	0	—	—	—	22	1	21
Cherry Jello	8	8	0	0	—	0	—	—	—	63	0	63
Cole Slaw	69	69	0	0	—	0	—	—	—	60	3	60
Cranberry, Pineapple	33	33	0	0	—	0	—	—	—	0	—	0
Fruit Cocktail	27	27	0	0	—	0	—	—	—	0	—	0
Fruit Cocktail, Jello	7	7	0	0	—	0	—	—	—	0	—	0
Fruit Gelatin	0	—	0	0	—	0	—	—	—	27	1	26
Garden	27	27	0	0	—	0	—	—	—	1	0	1
Golden Glow	46	46	0	0	—	0	—	—	—	0	—	0
Jellied Cherry	3	3	0	0	—	0	—	—	—	0	—	0
Jellied Fruit Cocktail	5	5	0	0	—	0	—	—	—	0	—	0
Jellied Orange Pineapple	4	4	0	0	—	0	—	—	—	0	—	0
Jellied Pears	5	5	0	0	—	0	—	—	—	3	0	3
Jellied Pineapple Pear	8	8	0	0	—	0	—	—	—	1	0	1
Jellied Strawberry Pineapple	2	2	0	0	—	0	—	—	—	1	0	1
Jello	5	5	0	0	—	0	—	—	—	0	—	0
Lemon Jello	1	1	0	0	—	0	—	—	—	0	—	0
Lettuce	20	20	0	0	—	0	—	—	—	17	2	15
Lettuce & Cucumber	13	13	0	0	—	0	—	—	—	3	0	13
Lettuce & Onion	1	1	0	0	—	0	—	—	—	1	0	1
Lettuce & Tomato	6	6	0	0	—	0	—	—	—	6	0	6
Meat & Cheese	1	1	0	0	—	0	—	—	—	0	—	0

TABLE 1: Microbiological results of analyzing foods prepared by the Central Food Preparation System (Cont)

FOOD ITEM	Aerobic Plate Count/ <i>g</i>							Coliforms/ <i>g</i>												
	N	<10 ²	10 ² -	10 ³ -	10 ⁴ -	10 ⁵ -	10 ⁶ -	N	<10	11-	21-	31-	41-	51-	61-	71-	81-	91-	100	>100
<u>SALADS (Cont)</u>																				
Melba Jello	30	23	5	2	0	0	0	30	30	0	0	0	0	0	0	0	0	0	0	0
Orange Pineapple Jello	29	21	5	3	0	0	0	29	29	0	0	0	0	0	0	0	0	0	0	0
Peach Jello	16	14	2	0	0	0	0	16	16	0	0	0	0	0	0	0	0	0	0	0
Pear Jello	31	20	7	4	0	0	0	31	31	0	0	0	0	0	0	0	0	0	0	0
Perfection	54	24	22	8	0	0	0	54	53	0	1	0	0	0	0	0	0	0	0	0
Pineapple Banana	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
Pineapple, Lettuce & Cheese	5	0	0	0	0	4	1	5	0	0	0	0	0	0	0	0	0	0	0	0
Pineapple, Pear Jello	19	10	8	1	0	5	0	19	19	1	0	0	0	0	0	0	0	0	0	5
Pineapple, Cheese	9	0	1	1	1	5	2	9	5	1	0	0	0	0	0	0	0	0	0	0
Pineapple, Pear & Banana	12	12	0	0	0	0	0	12	11	1	0	0	0	0	0	0	0	0	0	3
Spiced Cherry Jello	26	20	5	1	0	0	0	26	25	1	0	0	0	0	0	0	0	0	0	0
Spiced Peach	20	12	6	1	0	1	0	20	20	0	0	0	0	0	0	0	0	0	0	0
Spring	23	0	0	5	10	8	23	1	0	0	0	3	0	0	0	0	0	0	0	0
Strawberry Banana	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	18
Strawberry Pineapple	10	7	3	0	0	0	0	10	10	0	0	0	0	0	0	0	0	0	0	0
Strawberry Pineapple Banana	12	9	3	0	0	0	0	12	11	0	0	0	0	0	0	0	0	0	0	0
Three Bean	20	5	2	7	5	1	0	20	16	1	0	0	0	0	0	0	0	0	0	1
Tossed	55	0	2	18	22	13	55	7	3	1	0	1	0	0	0	0	0	0	0	3
Vegetable, Marinated	6	3	0	2	1	0	0	6	5	0	1	0	0	0	0	0	0	0	0	0
<u>SANDWICHES</u>																				
BBQ Beef	2	2	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0
Bologna & Cheese	7	1	1	1	0	0	0	3	1	1	1	0	0	0	0	0	0	0	0	0
Bologna & Salami	1	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Cheese	1	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1
Cheese & Ham	14	1	3	2	0	2	5	1	14	7	0	0	0	0	0	0	0	0	0	5
Cheese, Ham & Salami	4	1	0	2	0	0	1	4	2	0	1	0	0	0	0	0	0	0	0	2
Cheese & Salami	1	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
Chicken Fried Steak	1	1	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Roast Beef	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Salami	7	1	0	5	1	0	0	0	7	6	0	0	0	0	0	0	0	0	0	0
Sloppy Joe	3	1	0	2	0	0	0	3	3	0	1	1	0	0	0	0	0	0	0	0
Steak & Onion	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
<u>SAUCES</u>																				
BBQ	14	6	1	5	2	0	0	0	14	14	0	0	0	0	0	0	0	0	0	0
Chili	4	0	2	2	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0
Fish	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
Raisin	2	2	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0
Seafood Cocktail	1	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
Spaghetti	61	35	24	2	1	1	0	0	60	57	0	0	0	0	0	0	0	0	0	2
Tartar	2	1	1	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0
Veal Parmigiana	12	3	9	0	0	0	0	12	12	0	0	0	0	0	0	0	0	0	0	0

TABLE 1: Microbiological results of analyzing foods prepared by the Central Food Preparation System (Cont)

FOOD ITEM	<u>S. aureus</u> Count/g			<u>C. perfringens</u> Count/g			<u>Salmonella</u>			<u>E. coli</u>		
	N	<100	≥100	N	<100	≥100	N	POS	NEG	N	POS	NEG
<u>SALADS (Cont)</u>												
Melba Jello	30	30	0	0	0	—	0	—	0	0	—	—
Orange Pineapple Jello	29	29	0	0	0	—	0	—	0	0	—	—
Peach Jello	16	16	0	0	0	—	0	—	6	0	6	6
Pear Jello	31	31	0	0	0	—	0	—	6	0	6	6
Perfection	45	45	0	0	0	—	0	—	9	0	9	9
Pineapple Banana	1	1	0	0	0	—	0	—	0	0	—	—
Pineapple, Lettuce & Cheese	5	5	0	0	0	—	0	—	3	0	3	3
Pineapple Pear Jello	18	18	0	0	0	—	0	—	0	—	—	—
Pineapple Cheese	8	8	0	0	0	—	0	—	7	3	4	4
Pineapple, Pear & Banana	12	12	0	0	0	—	0	—	0	—	—	—
Spiced Cherry Jello	25	25	0	0	0	—	0	—	0	—	—	—
Spiced Peach	20	20	0	0	0	—	0	—	0	—	—	—
Spring	22	22	0	0	0	—	0	—	22	1	21	21
Strawberry Banana	1	1	0	0	0	—	0	—	0	—	—	—
Strawberry Pineapple	10	10	0	0	0	—	0	—	0	—	—	—
Strawberry Pineapple Banana	12	12	0	0	0	—	0	—	0	—	—	—
Three Bean	20	20	0	0	0	—	0	—	11	0	11	11
Tossed	55	55	0	0	0	—	0	—	55	0	55	55
Vegetable, Marinated	6	6	0	0	0	—	0	—	2	0	2	2
<u>SANDWICHES</u>												
BBQ Beef	2	2	0	0	0	—	1	0	1	0	—	—
Bologna & Cheese	7	7	0	0	0	—	7	0	7	1	0	1
Bologna, Cheese & Salami	1	1	0	0	0	—	1	0	1	0	—	—
Bologna & Salami	1	1	0	0	0	—	1	0	1	0	—	—
Cheese	14	13	1	0	0	—	12	0	12	8	0	8
Cheese & Ham	4	4	0	0	0	—	3	0	3	1	0	1
Cheese, Ham & Salami	1	1	0	0	0	—	1	0	1	0	—	—
Cheese & Salami	1	1	0	0	0	—	1	0	1	0	—	—
Chicken Fried Steak	1	1	0	0	0	—	1	0	1	0	1	1
Roast Beef	1	1	0	0	0	—	1	0	1	0	—	—
Salami	7	7	0	0	0	—	7	0	7	1	0	1
Sloppy Joe	3	3	0	0	0	—	3	0	3	1	0	1
Steak & Onion	1	1	0	0	0	—	1	0	1	1	0	1
<u>SALADS</u>												
BBQ	14	14	0	6	6	0	13	0	13	6	0	6
Chili	4	4	0	4	4	0	4	0	4	4	0	4
Fish	1	1	0	0	0	—	1	0	1	1	0	1
Raisin	2	2	0	0	0	—	0	—	0	—	—	—
Seafood Cocktail	0	—	0	0	0	—	0	—	0	—	—	—
Spaghetti	61	61	0	45	45	0	60	0	60	43	0	48
Tartar	2	2	0	0	0	—	0	—	0	—	—	—
Veal Parmigiana	12	12	0	8	8	0	12	0	12	10	0	10

TABLE 1: Microbiological results of analyzing foods prepared by the Central Food Preparation System (Cont)

FOOD ITEM	Aerobic Plate Count/ <i>g</i>										Coliforms/ <i>g</i>											
	N	<10 ²	10 ² -	10 ³ -	10 ³ -	10 ⁴ -	10 ⁴ -	10 ⁵ -	10 ⁵ -	10 ⁶ -	N	<10	11-	21-	31-	41-	51-	61-	71-	81-	91-	
<u>SAUSAGE</u>																						
Bologna Salami	223	33	40	43	31	28	3	232	173	24	10	5	1	2	1	1	1	1	1	1	0	14
	124	30	2	45	29	18	0	125	109	4	1	2	0	2	1	1	1	1	1	0	0	5
<u>SEAFOOD</u>																						
Fish, Baked	1	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	
Fish Patties	1	1	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	
Shrimp Creole	16	3	1	4	7	1	0	18	17	0	1	0	0	0	0	0	0	0	0	0	0	
Tuna & Noodles																						
<u>Soup</u>																						
Bean	10	5	3	2	0	0	0	10	10	0	0	0	0	0	0	0	0	0	0	0	0	
Beef	2	2	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	
Cream of Potato	3	0	2	1	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	
Creole	9	8	0	1	0	0	0	9	9	0	0	0	0	0	0	0	0	0	0	0	0	
Kirchbocker	10	4	2	4	0	0	0	10	10	0	0	0	0	0	0	0	0	0	0	0	0	
Minestrone	10	6	2	2	0	0	0	10	10	0	0	0	0	0	0	0	0	0	0	0	0	
Potato	1	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	
Spanish	5	1	2	0	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	
Vegetable	15	11	4	0	0	0	0	15	15	0	0	0	0	0	0	0	0	0	0	0	0	
<u>TOPPINGS</u>																						
Cherry	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	
Chocolate	2	0	0	2	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	
Vanilla	1	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	
<u>VEAL</u>																						
Burgers	7	0	1	1	1	4	0	7	1	0	0	0	0	0	1	0	0	0	0	0	1	
Loaf	6	2	2	1	0	1	0	6	4	0	0	0	0	0	0	0	0	0	0	0	2	
Parmigiana	5	2	1	0	1	0	0	5	4	0	0	0	0	0	0	0	0	0	0	0	1	
Roast	2	1	0	1	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	
<u>VEGETABLES</u>																						
Beans, Baked	20	8	9	3	0	0	0	19	18	0	0	0	0	1	0	0	0	0	0	0	0	
Beets	5	3	1	0	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	
Broccoli	7	0	0	3	2	0	0	7	6	0	1	0	0	0	0	0	0	0	0	0	0	
Cabbage	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	
Carrots	4	2	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	
Cauliflower	29	5	3	8	5	2	0	23	21	1	0	0	0	1	0	0	0	0	0	0	0	
Celery, Diced	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	
Corn Dishes	12	3	6	3	0	0	0	12	11	0	0	0	0	0	0	0	0	0	0	0	0	
Egg Plant	9	5	2	2	0	0	0	9	9	0	0	0	0	0	0	0	0	0	0	0	0	

TABLE 1: Microbiological results of analyzin® foods prepared by the Central Food Preparation System (Cont.)

FOOD ITEM	<u>S. aureus</u> Count/n			<u>C. perfringens</u> Count/n			<u>Salmonella</u>			<u>E. coli</u>				
	N <100	≥100	N <100	N <100	≥100	N <100	N <100	≥100	N <100	N <100	≥100	N <100	N <100	≥100
<u>SAUSAGE</u>														
Bologna Salami	229 117	229 115	0 2	0 0	0 0	0 0	0 0	0 1	0 0	4 1	0 1	133 74	2 0	131 74
<u>SEAFOOD</u>														
Fish, Baked Fish Patties Shrimp Creole Tuna & Noodles	1 1 0 18	1 1 - 0	0 0 0 9	0 0 0 9	0 0 0 0	0 0 0 0	0 0 0 17	0 0 0 17	0 0 0 17	0 1 1 0	1 1 1 12	0 0 0 0	0 0 0 12	
<u>Soup</u>														
Bean Beef Cream of Potato Creole Knickelbocker Minestrone Potato Spanish Vegetable	10 2 3 9 10 10 1 3 15	10 2 3 9 10 10 1 5 15	0 0 0 0 0 0 0 0 0	1 0 0 0 0 0 0 0 0	1 0 0 0 0 0 0 0 0	0 - - - - - - - 0	10 2 3 9 10 10 1 5 15	0 0 0 0 0 0 0 0 0	0 2 3 0 0 0 1 0 15	10 2 3 0 10 10 0 5 0	4 2 0 0 0 0 0 0 15	0 0 0 0 0 0 0 0 8	0 0 0 0 0 0 0 0 8	
<u>TOPPINGS</u>														
Cherry Chocolate Vanilla	1 2 1	1 2 1	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	
<u>VFAI</u>														
Burgers Loaf Parmesiana Roast	7 6 5 2	7 6 5 2	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	3 3 3 2	0 0 0 0	3 6 3 2	7 6 3 2	5 2 3 2	
<u>VEGETABLES</u>														
Beans, Baked Beets Broccoli Cabbage Carrots Cauliflower Celery, Diced Corn Dishes Ferb Plant	20 5 7 1 5 30 1 12 9	20 5 7 1 5 30 1 12 9	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	2 0 0 0 0 1 0 0 0	0 - - - - 0 - - -	0 2 2 0 2 0 0 0 0	0 0 0 0 0 0 0 0 0	17 2 2 0 2 24 0 - 9	0 2 4 1 2 20 0 0 9	17 2 4 1 2 20 0 0 9	12 0 4 0 2 3 3 0 4	12 0 4 0 2 20 0 0 4	

TABLE 1: Microbiological results of analyzing foods prepared by the Central Food Preparation System (Cont)

FOOD ITEM	Aerobic Plate Count/ μ						Coliforms/ μ												
	N	<10 ²	10 ² -10 ³	10 ³ -10 ⁴	10 ⁴ -10 ⁵	10 ⁵ -10 ⁶	10 ⁶ -10 ⁷	N	<10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	>100
VEGETABLES (Cont)																			
Onion	7	1	4	2	0	0	0	7	7	0	0	0	0	0	0	0	0	0	0
Peas, Creamed	2	1	1	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0
Peppers, Stuffed	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Potato Dishes	115	44	28	30	11	2	0	115	106	2	1	0	0	0	1	1	0	0	0
Spanish Rice	11	6	3	0	2	0	0	11	11	0	0	0	0	0	0	0	0	0	4
Spinach	2	1	0	0	0	1	0	2	2	0	0	0	0	0	0	0	0	0	0
Summer Squash	2	2	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0
Sweet Potatoes	35	28	6	1	0	0	0	35	34	1	0	0	0	0	0	0	0	0	0
Tomatoes, Stewed	2	1	1	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0
Tomatoes, Fresh	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
S. aureus Count/ μ																			
FOOD ITEM	N	<100	100-200	N	<100	100-200	N	<100	100-200	N	POS	NEG	N	POS	NEG	N	POS	NEG	E. coli
S. perfringens Count/ μ																			
FOOD ITEM	N	<100	100-200	N	<100	100-200	N	<100	100-200	N	POS	NEG	N	POS	NEG	N	POS	NEG	Salmonella
VEGETABLES (Cont)																			
Onion	7	7	0	0	0	0	0	6	6	0	6	0	4	4	0	4	0	4	4
Peas, Creamed	2	2	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	1	1
Peppers, Stuffed	1	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0
Potato Dishes	114	114	0	0	3	8	0	79	79	0	79	0	56	56	0	56	0	56	56
Spanish Rice	11	11	0	0	0	0	0	11	0	11	0	11	8	8	0	8	0	8	8
Spinach	2	2	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	1	1
Summer Squash	2	2	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	1	1
Sweet Potatoes	35	35	0	0	0	0	0	30	30	0	30	0	23	23	0	23	0	23	23
Tomatoes, Stewed	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tomatoes, Fresh	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*Up to 190,000/ μ **Up to 58,000/ μ

N - Number of sample items analyzed by specific procedure.

TABLE 2: Microbiological results by food classification of foods prepared by the Central Food Preparation System

FOOD ITEM	Aerobic Plate Count/g						Coliforms/g														
	N	<10 ²	10 ² -3 ⁴	10 ³ -4 ⁵	10 ⁴ -5 ⁶	10 ⁵ -6 ⁷	10 ⁶ -7 ⁸	N	<10	10-20	30-40	50-60	60-70	70-80	80-90	90-100	>100				
BAKERY PRODUCTS	4.9	31	8	8	1	0	1	51	41	0	0	0	0	1	0	5	4				
BEEF, COOKED	737	296	210	148	57	25	1	712	638	11	7	3	4	5	1	3	5				
BEEF, RAW	36	3	1	3	13	11	5	34	2	1	0	3	1	1	0	0	4				
CHEESE	162	33	2	22	6	30	69	283	219	9	9	2	5	1	4	1	22				
CHILLI	82	6	13	49	13	1	0	34	84	0	0	0	0	0	0	0	20				
LUNCHEON MEAT	63	19	0	10	12	12	10	63	57	1	1	1	0	0	0	0	3				
MISCELLANEOUS	138	42	33	32	12	11	8	145	140	1	1	0	0	1	0	0	1				
PORK	664	242	147	156	78	38	3	671	396	37	26	21	16	14	6	12	128				
POULTRY	222	107	63	40	9	3	0	221	206	3	1	0	0	0	0	0	2				
SALADS	783	323	105	66	114	122	53	785	501	11	21	4	10	0	1	1	18				
SANDWICHES	44	10	5	13	4	9	3	37	26	0	1	1	0	1	0	0	8				
SAUCES	97	48	37	10	2	0	0	96	93	0	0	0	1	0	0	0	2				
SAUSAGE	352	113	42	83	60	46	3	357	282	28	11	7	1	4	2	2	19				
SEAFOOD	19	4	1	5	8	1	0	21	20	0	1	0	0	0	0	0	0				
Soup	65	37	15	13	0	0	0	65	65	0	0	0	0	0	0	0	0				
TOPPING	4	1	0	3	0	0	0	4	4	0	0	0	0	0	0	0	0				
VEAL	20	5	4	5	1	5	0	20	11	0	0	0	1	0	0	1	7				
VEGETABLES	266	112	65	57	18	7	7	258	241	4	2	1	1	0	1	0	7				
TOTALS	3803	1432	751	728	408	321	163	3907	3026	106	81	44	39	27	15	19	7				
																	482				
FOOD ITEM	<u>S. aureus</u> Count/g						<u>C. perfringens</u> Count/g						<u>Salmonella</u>						<u>E. coli</u>		
	N	<100	≥100	N	<100	≥100	N	<100	≥100	N	POS	NEG	N	POS	NEG	N	POS	NEG			
BAKERY PRODUCTS	46	46	0	0	0	-	13	0	13	5	0	5	0	0	5	0	5				
BEEF, COOKED	730	716	14	356	345	11	625	0	625	483	29	454									
BEEF, RAW	4.7	45	2	2	2	0	22	0	22	31	16	15									
CHEESE	264	260	4	0	-	-	18	0	18	85	34	51									
CHILLI	84	34	0	46	46	0	82	0	82	55	1	54									
LUNCHEON MEAT	55	54	1	0	-	-	4	0	4	33	0	33									
MISCELLANEOUS	145	144	1	52	52	0	122	0	122	83	2	81									
PORK	683	652	31	66	43	23	133	0	133	446	8	438									
POULTRY	222	222	0	76	76	0	210	0	210	176	0	176									
SALADS	749	748	1	0	-	-	0	-	-	324	69	255									
SANDWICHES	44	43	1	0	-	-	40	0	40	15	0	15									
SAUCES	96	96	0	63	63	0	91	0	91	70	0	70									
SAUSAGE	346	344	2	0	-	-	5	0	5	207	2	205									
SEAFOOD	20	20	0	9	9	0	19	0	19	15	0	15									
Soup	65	65	0	12	12	0	65	0	65	29	0	29									
TOPPING	4	4	0	0	-	-	0	-	-	0	-	-									
VEAL	20	20	0	0	-	-	11	0	11	18	7	11									
VEGETABLES	266	266	0	10	10	0	189	0	189	144	0	144									
TOTALS	3886	3829	57	692	658	34	1649	0	1649	2219	163	2051									

TABLE 3: The number of food samples, listed by food classification, which failed to meet guideline criteria when analyzed for aerobic plate count (APC) and coliform count (CC)

Food Classification	Category	Guideline*	Number* Samples Analyzed	Number* Samples Exceeding Trigger Criterion	Guideline	Criterion	Samples Analyzed for APC		Samples Analyzed for CC	
							Number* Samples Exceeding Trigger Criterion	Number* Samples Analyzed	Number* Samples Exceeding Trigger Criterion	Number* Samples Analyzed
Bakery Products	b	49	1	2	51	10	None			
Beef, Cooked	a	737	26	83	721	74	14/730 samples >100/g <u>S. aureus</u> , 11/356 samples >100/g <u>C. perfringens</u> , 29 samples <u>E. coli</u> positive			
Beef, Raw	**	**	**	**	283	**	2/47 samples >100/g <u>S. aureus</u> , 16 samples <u>E. coli</u> positive			
Cheese	d	***	***	***	64	4/260 samples >100/g <u>S. aureus</u> , 34 samples <u>E. coli</u> positive				
Chili	a	82	1	14	84	0	1 sample <u>E. coli</u> positive			
Luncheon Meat	d	***	***	***	63	6	1/55 samples >100/g <u>S. aureus</u>			
Miscellaneous ****	a	138	1	6	145	5	1/145 samples >100/g <u>S. aureus</u> , 3 samples <u>E. coli</u> positive			
Pork	a	664	41	119	671	275	31/633 samples >100/g <u>S. aureus</u> , 23/66 samples >100/g <u>C. perfringens</u> , 8 samples <u>E. coli</u> positive			
Poultry	a	222	3	12	221	15	None			
Salads	c	783	0	289	**	**	1/749 samples >100/g <u>S. aureus</u> , 69 samples <u>E. coli</u> positive			
Sandwiches ***	d	44	0	0	37	11	1/44 samples >100/g <u>S. aureus</u>			
Sauces	a	97	0	2	96	3	None			
Sausage ****	d	352	31	62	357	75	2/346 samples >100/g <u>S. aureus</u> , 2 samples <u>E. coli</u> positive			
Seafood	a	19	1	9	21	1	None			
Soup	a	65	0	0	65	0	None			
Topping	a	4	0	0	4	0	None			
Veal	a	20	5	6	20	9	7 samples <u>E. coli</u> positive			
Vegetables	a	266	14	32	253	17	None			

* Guideline and trigger criteria described in Results and Discussion

** No criteria

*** Not applicable to cultured product

**** Total number of samples analyzed, but only non-cultured items reported as exceeding guidelines

TABLE 4: Yeast and mold counts of food samples produced by the Central Food Preparation System

FOOD ITEM	Number of Samples	Yeast & Mold Count/g		
		<10	10-100	>100
Bologna	2	1	1	0
Cheddar Cheese	18	16	0	2
Cheddar & Swiss Diced	2	2	0	0
Cheese & Salami Sandwich	1	1	0	0
Orange Pineapple Jello	2	2	0	0
Pineapple Pear Banana	1	1	0	0
Salami Sliced	1	0	0	1
Spiced Peach	1	1	0	0
Total	28	24	1	3

GLOSSARY OF TERMS AND ABBREVIATIONS

APC - Aerobic Plate Count	MPN - Most Probable Number
CC - Coliform Count	QC - Quality Control
CFM - Central Food Manager	SDF - Satellite Dining Facility
CFMS - Central Food Management	TDA - Table of Distribution and System
CFPF - Central Food Preparation	TISA - Troop Issue Subsistence Facility
CFPS - Central Food Preparation	TO&E - Table of Organization and System
DA - Department of Army	TSA - Troop Support Agency
IPA - Ingredient Preparation	TSO - Technical Support Office
Area	WRAMC - Walter Reed Army Medical
IST - Internal Sanitation Team	Center
MLT - Microbiology Laboratory Team	

OFFICIAL DISTRIBUTION LIST

Commander
US Army Medical Research and
Development Command
Fort Detrick, Frederick, MD 21701

Defense Documentation Center
ATTN: DDC-TCA (12 cys)
Cameron Station
Alexandria, VA 22314

Director of Defense Research and Engineering
ATTN: Asst Dir (Environmental and Life Sciences)
Washington, DC 20301

The Surgeon General
ATTN: DASG-TLO
Washington, DC 20314

Superintendent
Academy of Health Sciences
US Army
ATTN: AHS-COM
Fort Sam Houston, TX 78234

Assistant Dean
Inst & Rsch Support
Uniformed Services University
of Health Sciences
6917 Arlington Road
Bethesda, MD 20014

Commander
US Army Environmental Hygiene Agency
Aberdeen Proving Ground, MD 21070

US Army Research Office
ATTN: Chem & Bio Sci Div
P.O. Box 1221
Research Triangle Park, NC 27709

Biological Sciences Division
Office of Naval Research
Arlington, VA 22217

Director of Life Sciences
USAF Office of Scientific Research (AFSC)
Bolling AFB
Washington, DC 20332

Director
Walter Reed Army Institute of Research
Washington, DC 2001

Commander
US Army Medical Research
Institute of Infectious Diseases
Fort Detrick, Frederick, MD 21701

Commander
US Army Research Institute
of Environmental Medicine
Natick, MA 01760

Commander
US Army Institute of Surgical Research
Brooke Army Medical Center
Fort Sam Houston, TX 78234

Commander
US Army Institute of Dental Research
Washington, DC 20012

Commander
US Army Medical Bioengineering
Research & Development Laboratory
Fort Detrick, Frederick, MD 21701

Commander
US Army Aeromedical Research Laboratory
Fort Rucker, AL 36362

Director
US Army Biomedical Laboratory
Aberdeen Proving Ground
Edgewood Arsenal, MD 21010

Commander
Naval Medical Research Institute
National Naval Medical Center
Bethesda, MD 20014

Commander
USAF School of Aerospace Medicine
Aerospace Medical Division
Brooks AFB, TX 78235

Commander
USAF Aeromedical Research Laboratory
Wright-Patterson AFB, OH 45433

Dir of Prof Svcs
Office of the Surgeon General
Department of the Air Force
Washington, DC 20314

Deputy Technical Director
Food Service Systems Program
ORDNA-ZTF
US Army Natick Research &
Development Command
Natick, MA 01760

(2 cys)

Army Staff Monitor
DoD Food Program
OCRDA
DAMA-CSS-D
Washington, DC 20310 (2 cys)

Joint Technical Staff
US Army Natick Research &
Development Command
Natick, MA 01760

(4 cys)

US Army Natick Research &
Development Command
ATTN: Tech Library
Natick, MA 01760

C, US Army Vet Corps
HQDA (DASG-VCA)
Washington, DC 20310

C, Tech & Qlty Assurance Div
Directorate of Subsistence
HQ, DPSC
Philadelphia, PA 19101

C, Quality Control Div
AAFES-VO
Army & Air Force Exchange Service
Dallas, TX 75222

Dir Vet Services
US Army Health Services Command
Ft Sam Houston, TX 78234

Commander
196th Medical Detachment (VS)
MEDDAC K
APO San Francisco 96301

Veterinary Science Division
AHS (HSA-IVS)
Ft Sam Houston, TX 78234

US Army Medical Laboratory
AFZG-MDP-V
Ft Sam Houston, TX 78234 (10 cys)

HQ USAF/SGV
Bolling AFB
Washington, DC 20332 (5 cys)

HQ US Army Troop Support Agency
Veterinary Staff Office
ATTN: DALO-TAZ-V
Ft Lee, VA 23801 (2 cys)